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But worse than the ill-founded hypotheses of the head of one of the most important bureaus of the Department of Agriculture, which, moreover, receives and spends one of the largest appropriations in the budget of that department, is the return to medievalism indicated in the case before us. It is not only that of a deliberate attempt to suppress the truth, but it indicates on the part of the morally responsible head of that bureau a more than child-like confidence in the permanent success of the obscurantist régime such as is practiced and defended by Pobyedonostseff. Yet it is doubtful that even the latter, or the puissant head of the Russian Empire himself, would undertake to pass the censor's black brush over inductive scientific papers like these of King.

It is impossible to conceive that in the twentieth century, and especially in a country claiming to be progressive *par excellence*, such a régime should be allowed to continue for any length of time. King has uttered his '*e pur si muove*' by the publication of his rejected papers; it now behooves the scientific men of the country to voice their emphatic protest against the dictation of official orthodox science of any kind, from headquarters at Washington.

E. W. HILGARD.

BERKELEY, CALIF.,

September 29, 1904.

'THE METRIC FALLACY,' ONCE MORE.

TO THE EDITOR OF SCIENCE: It is not uncommon for professors of linguistic science to be asked the question, 'What do you think will be the common language of the civilized world when the different peoples adopt one?' Despite the impossibility of direct knowledge on such a subject, conjecture is easy. Probably the most plausible of such conjectures is that the Teutonic and Romance languages will continue the present process of intermingling indefinitely until a common language becomes the result, difference of language diminishing into mere difference of dialect. It may be fair to assume that the English language, now the one most widely in use, will be the most important of the different components of the future language of civilization, though we have to admit the

possibility that the Anglo-Saxon may give place within a few centuries to some progressive competitor, such as the Japanese. Supposing an international language thus to become developed by common consent due to common interests, international business both political and commercial will be facilitated. But even approximate uniformity of thought, of custom, of interest, has never yet received practical demonstration as a human possibility. If the future should develop a single universal language, it must be universal only in the sense of being a recognized standard from which many local offshoots will grow. No other view seems consistent with the continued existence of a reasonable degree of personal liberty.

Now, assume that a similar question is asked about the future coinage, weights and measures of the civilized world. The present chaos is bad enough, but far from being so bad as it was a century ago. The tendency has been unmistakably toward unification, but with the goal still far away. Any one who imagines that either the metric system or the British system, as formulated to-day, will meet all the requirements of both science and commerce a century or two hence, may be happy in his optimism, but he can not be credited with much appreciation of what experience has hitherto shown to be the processes of natural evolution.

In a recent communication (SCIENCE, September 16, p. 373) Mr. F. A. Halsey, writing in response to my criticisms of the attack upon the advocates of the metric system by Messrs. Halsey and Dale, says, "My purpose in writing this letter is to point out that Professor Stevens's admissions are of far greater importance than he seems to suspect." He considers me to have 'admitted pretty much all' that the antimetric contestants have contended for; but he admits that two important differences still exist. One is that I regard the change to the metric system as worth the cost, while he and Mr. Dale think it is not. The other is that I regard the change feasible, while he and Mr. Dale think it impossible. These two statements certainly indicate a considerable gulf between us, whatever may have

been the admissions made with a view to impartiality. The gulf seems incapable of being bridged by any structure built on the foundations set forth in Mr. Halsey's book. His self-complacent conclusion is, perhaps, the outcome of the fact that he is an avowed special advocate representing pecuniary interests that would suffer by the change considered, and that an advocate must claim everything in sight. His attitude can not possibly be judicial unless some miracle should suddenly bring about such a change of heart as to evoke words of penitence for his lack of appreciation of metric righteousness and of horror at his own British sinfulness.

What has been written by me about the metric system sets forth my own views alone. It was not intended to be representative of any other person or any pecuniary interests. It was an attempt to be fair, and as nearly as possible non-partisan, however cordial would be my welcome to the exclusive adoption of the metric system everywhere, if such were possible. There are doubtless many other metric advocates who do not share some of my views, and for whose opinions I entertain the highest respect. We may differ regarding the ease with which the change can be introduced, or as to the number of years of grace that should be allowed between initial and final legal enactments. The fact that my estimate regarding the limits of this period greatly exceeds that of some distinguished men does not in the least justify Mr. Halsey's assumption that I regard their view as 'worthless,' however limited may be the value of his own conclusion that the British inch is immovable, even 'until doomsday'—an infinity of years of grace. If my estimates are too liberal no one can hail the demonstration of such a mistake with more pleasure than myself.

My admission that among the uneducated on the continent of Europe the use of non-metric names and units is still common does not invalidate the claim of the metric advocates that the use of the metric system has become fairly well established among a majority of the educated classes in the same countries. Metric advocates who claim more

than this are probably exceptional. They certainly would not reverse their opinions because the peasantry are now, have always been and can always be expected to be extremely conservative. Mr. Halsey devotes four fifths of the space in his book to a demonstration of the persistence of old units everywhere in spite of legislation. No such demonstration would be necessary for any reader who has paid reasonable attention to history, or who has had the opportunity to observe the uneducated in our own country. He gives a list, nine pages in length, of 'non-metric units used in metric countries,' with their American equivalents. M. Guillaume, of the International Bureau of Measures, has recently shown (*Physical Review*, September, 1904, pp. 234-237) that much of this table is worthless, not only containing information that is false, but quoting as non-metric the local names of units which are in value identical with metric units. Out of nearly five hundred entries in this table it is safe to say that a majority are local and almost unknown to international commerce. This grand parade of misinformation is sufficiently in accord with Mr. Halsey's assertion, 'We have the simplest and the most uniform system of weights and measures of any country in the world.'

It is quite possible for metric advocates to recognize the force of conservatism and vested interests, and yet to have faith in the future approach toward international unification of weights and measures. Even if this should be accomplished by legislation and sustained by public demand in all the great commercial centers of the world, the peasantry can be depended upon to hold on to their local inherited units and to furnish the data for such a table as Mr. Halsey has collected with so much care.

Mr. Halsey is disappointed that no special notice was taken of two chapters which he regarded the best in his book. He endeavors to make a sharp line of division between scientific men and manufacturers. Of the former he says: "They are measures, not makers, and their opinions have no value and no application as related to manufacturing." This estimate likewise is not surprising in view of

the elastic use of the word 'scientific' among the populace. The expression of contempt just quoted manifests a very limited horizon, and the 'measurers' are probably able to avoid intrusion. But the day for such sharp distinctions is past. Everything depends upon what we mean by 'scientific.' A man may devote years to chemistry, or physics, or biology, without learning scientific method, by making himself a measurer and resting satisfied with such routine. Mr. Halsey does not seem to remember that discovery is an aim in the pursuit of science, or that the demonstration of originality is incomparably more important in determining scientific standing than the ability to measure, however important this may be as a means. The mental training understood to be 'scientific' has to be applied in every pursuit where close observation, orderly arrangement, accurate calculation, independent thought, patient industry and good judgment are necessary. The recent presiding officer of the society representing English and American chemical industries, which convened a few weeks ago in New York, has a world-wide reputation as a scientific man rather than as a measurer. His successor as president is an American manufacturer, but one whose exceptional mastery of scientific method has enabled him to achieve distinction as a 'maker' of chemicals. According to Mr. Halsey's classification the opinions of Sir William Ramsay should be of no importance to Mr. Nichols; and if one of them is a metric advocate the other should be anti-metric. Our distinguished English guest has had many pleasant things to express about America, but in regard to our manufacturers he felt constrained to say: "The majority of them do not make it a practice to read scientific journals or to familiarize themselves with the latest trend of scientific thought. English manufacturers are far ahead of Americans in this respect, and Germany shows a clean pair of heels to both." What would he have said after reading Mr. Halsey's extraordinary views?

Any citizen of our country, who has an interest in educational, scientific or commercial progress has a right to an opinion, and to

make himself heard if he can, regarding our weights and measures. To say that it is 'an industrial and commercial, and not a scientific question' is mere assumption. Some scientific manufacturers have expressed themselves in favor of the metric system. Mr. Halsey's claim, that scientific men who urge a change that may affect the immediate interests of manufacturers 'simply meddle with other people's affairs,' is as untenable as the claim of a politician who argues that no American has a right to urge tariff changes because they damage the interests of the trusts.

That the pecuniary interests to be affected by a change in our system of weights and measures are large and important is readily conceded. No one, moreover, will deny the great advantage of standardization for screw threads, pipes and textiles, or that a change of standards would be expensive. Mr. Halsey says that manufacturers know this to be 'impossible.' This is not conceded, either by metric advocates or by all manufacturers. In some departments of industry metric standardization has become established in Europe; and if for the same industry a metric standard is in use in one country and a British standard in another the abandonment of one of these will at last be necessary, even if it involves 'meddling with other people's affairs.' The two chapters of Mr. Halsey's book which he regards as the most important thus fail to establish anything more than what was already apprehended, that 'certain people would lose money and otherwise suffer much inconvenience, by the change.' His assumption of 'impossibility' is entirely in keeping with the lack of 'scientific' or judicial fairness in the rest of his book.

The universal and exclusive employment of the metric system, if at all within the bounds of possibility, is so remote that it needs no consideration. What we do need, and what seems quite possible at no very distant day, is an international system of weights and measures, adopted by the central governments of the civilized world for use in all international commerce and in all government work. This would not compel American or English manufacturers to change their standards for

most of their customers, but it would put them to some extra expense and inconvenience if government purchases are made in the best market. Whether this international system should be exclusively metric is a matter of policy requiring careful consideration. The yard may be lengthened to equality with the meter, or the meter may be lengthened to forty inches, or many British units may be discarded and some metric units may be substituted for them, while some British units are retained. In any case the change, whatever it be, must tend toward unification and simplicity. It must necessarily cause initial increase of confusion, which will pass away without unreasonable delay in great commercial centers. Outside of such centers the people may be expected to hold on to their old habits; and in the remote rural districts hundreds of years may be insufficient to bring about uniformity. The essential desideratum is definiteness in value and simplicity in mutual relation among the units adopted. The mere nomenclature is of subordinate importance. Old names will certainly be retained by the masses even if values are modified, just as a dozen different values existed a few years ago for what was called foot, fuss, pied, etc. The change in values will be much easier for the masses if the old names are retained by legal provision; but this is a matter for which there is plenty of time. The Archimedean lever is indeed unknown, but even the English inch has been 'moved' in the past and Mr. Halsey's 'impossibilities' are no greater than what have been gradually overcome in the past and what may be gradually overcome in the future.

W. LE CONTE STEVENS.

WASHINGTON AND LEE UNIVERSITY,
October 3, 1904.

PROFESSOR WILLIAM MORTON WHEELER ON THE
KELEP.

IN SCIENCE of September 30 (p. 437) Professor William Morton Wheeler has discussed the introduction into the United States of the kelep or Guatemalan cotton-protecting ant, and has reached decidedly adverse conclusions. Every new proposition must, of course, run

the gauntlet of criticism, scientific and unscientific. Professor Wheeler claims special 'liberty to comment' because of 'exceptional opportunities,' but he nevertheless disregards several facts which might have mitigated the confidence of the prophecy.

It becomes apparent that the Poneridæ with which he is acquainted must be very different from the kelep. After observing colonies of *Ectatomma* and *Odontomachus*, both in nature and in captivity, I am ready to follow Mayr and Ashmead in assigning these genera to separate families, as unlike, indeed, as rats and rabbits. Whatever may be true of other Poneridæ or Odontomachidæ, it seems that the species of *Ectatomma* are widely distributed, enterprising ants. The kelep, instead of being a rare 'archaic' curiosity, is decidedly the dominant and most abundant insect of the Guatemalan cotton fields. The colonies, too, are several times as large as supposed by Professor Wheeler. They contain, usually, between 200 and 300 individuals, instead of from 40 to 50. There are seldom less than 100, and sometimes 400 or more.

The adaptability of the kelep is further shown by its association with the cotton for the sake of its nectar, as well as by its skill in stinging the boll-weevil. It is true, as Professor Wheeler says, that there are other pugnacious ants which 'attack' boll-weevils (or, for that matter, anything else which comes in their way), but they let them go again, and have no standing as 'destroyers.' To sting, disable, carry off, dismember and consume the pest, is still the unique distinction of the kelep.

Like some editors of newspapers Professor Wheeler will not be satisfied with the ants unless they absolutely exterminate the weevils, 'chase them into the Gulf of Mexico,' etc. The planters would probably be grateful, however for an addition of even ten per cent. to their crop—which illustrates the difference of standpoints. That the keleps make a regular practise of killing weevils renders them of distinct agricultural interest; the question is no longer whether they are useful, but whether we can get enough of them. Just how effi-